

CASE STUDY



**Mid-Size EPC Reduces Cost of Innovative Ethanol Dehydration System
By 18% with Aspen Custom Modeler**

“Using Aspen Custom Modeler, Hitachi Zosen Corporation was not only able to model an innovative, emerging technology, but also integrate it into a larger system and evaluate the cost of the full solution.”

- Masashi Okada, Senior Process Engineer, Hitachi Zosen



Hitachi Zosen Corporation is an EPC based out of Japan that designs and constructs waste treatment plants, industrial plants, and machinery and equipment for industrial and construction purposes.

Set on being on the forefront of innovative products that are useful to society and technology, Hitachi Zosen has taken on projects spanning from waste-to-energy plants to salt water desalination and earthquake protection for bridges.

To remain competitive, Hitachi Zosen needs to ensure that each product is not only innovative, but also allows their client to retain a competitive edge with traditional products and other emerging technologies.

Programming with ACM provided a program that not only allowed for consistent physical properties, but was easier to understand, maintain, and troubleshoot.

CUSTOMER PROFILE - Hitachi Zosen Corporation - EPC

CHALLENGE

Consider and develop a zeolite membrane alternative to traditional ethanol dehydration.

SOLUTION

Use Aspen Custom Modeler to model an emerging technology.

BENEFITS

- Explored multiple variations of a custom unit within an integrated model to find optimal conditions, including inlet vapor composition and pressure
- Considered both capital costs and operational costs with activated economics while simultaneously exploring designs
- Reduced the cost by 18% in the conceptual design stage of the project

Using both Aspen Custom Modeler (ACM) and Aspen Process Economic Analyzer (APEA), Hitachi Zosen has the ability to model novel processes integrated into larger systems while also keeping track of the bottom line. Being able to consider the cost while simultaneously designing a new technology not only allows for a better solution, but with fewer iterations in the conceptual stage, saving time and money.

CUSTOMIZE A MODEL FOR AN INNOVATIVE PRODUCT

Removing excess water from ethanol is an expensive and time-consuming step that limits ethanol competitiveness in the energy market. To be added to gasoline, a mixture needs to be at least 99.5% ethanol. With an azeotrope that limits water removal from mixtures to 95% ethanol, a cheap and effective means of reaching higher ethanol content is currently in high demand.

With a zeolite membrane solution in mind, Hitachi Zosen was able to produce a solution, the Hitz Dehydration System (HDS). Prior to using ACM, Hitachi Zosen ran into an issue with physical property consistency using a home-grown segmented model of the membrane.

Hitachi Zosen was able to consider the costs associated with each iteration and narrow down the solutions to the most cost effective and energy saving methods.

Programming with ACM provided a program that not only allowed for consistent physical properties, but was easier to understand, maintain, and troubleshoot.

By considering the entire system in the conceptual phase, Hitachi Zosen reduced the total cost of the system by 18%.

AN INTEGRATED MODEL ALLOWS FOR REDUCED ENERGY COSTS

Hitachi Zosen modeled the system surrounding the HDS, particularly with the addition of the initial distillation column. This allowed Hitachi Zosen to explore different conditions entering the HDS, such as pressure and vapor fraction to optimize the entire process. By using APEA and information on the cost of the zeolite membrane, Hitachi Zosen was able to consider the costs associated with each iteration and narrow down the solutions to the most cost effective and energy saving methods. By considering the entire system in the conceptual phase, Hitachi Zosen reduced the total cost of the system by 18%. Hitachi Zosen also had the benefit of being able to carry out dynamic studies to consider start-up, shut-down, and safety scenarios.

FUTURE INNOVATION

The success of this study has allowed Hitachi Zosen to develop a platform for further, more detailed development of their zeolite membrane alternative to traditional ethanol dehydration. Having the ability to consider the larger picture and the costs associated with the full system at hand, Hitachi Zosen will likely remain at the forefront of this emerging technology.

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